

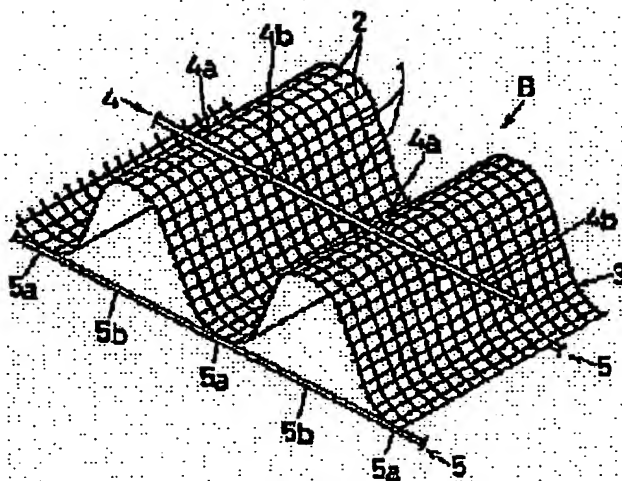
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THREE-DIMENSIONAL FABRIC**Publication number:** JP8226045**Publication date:** 1996-09-03**Inventor:** HIROHASHI TOSHIJI; FUJII HISATOMI**Applicant:** NIPPON WAIDO CLOTH KK; FUJII HISATOMI**Classification:****- International:** A01G31/00; B01D39/08; D03D15/04; D03D19/00;
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D03D19/00**- european:****Application number:** JP19950058152 19950221**Priority number(s):** JP19950058152 19950221

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Abstract of JP8226045

PURPOSE: To form a good wavy shape, secure high resilience by constituting a fabric in wavy form by dry heat restriction shrinkage treatment using a highly shrinkable yarn and improve shape stability, and remarkably improve tensile strength and carry out remarkable shortening of heat treating time by arranging highly shrinkable yarn on both faces of ground structure. **CONSTITUTION:** A ground structure 3 in which warp 1 and weft 2 made of monofilament yarn is constituted in plane weave or doup weave is provided and highly shrinkable yarns 4 and 5 with $\geq 30\%$ shrinkage factor having mixing parts 4a and 5a binding to the vertical direction of the surface and rear of the ground structure 3 and unbound float weave parts 4b and 5b are arranged at a prescribed interval to constitute a woven fabric, which is then subjected to dry heat restriction shrinkage treatment to constitute the fabric in wavy form.



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Japanese patent laid-open publication No. 226045/1996

(Extract Translation)

[Title of the Invention]

Tree-Dimensional Fabric

[Claim(s)]

[Claim 1] Three-dimensional structure cloth of a woven fabric comprising: a ground structure constituted of warp and weft made of monofilament yarn woven in plane or leno weave; and highly shrinkable yarns with shrinkage factor of 30% or more arranged at a predetermined interval and having a mixed weave portion partially bound on front and rear surfaces of said ground structure in a vertical direction and an unbound float weave portion, said fabric being subjected to dry heat restriction shrinkage treatment to be wavy.

[Claim 2] The three-dimensional structure cloth as defined in claim 1, wherein said highly shrinkable yarns are composed of copolymer polyethylene terephthalate.

[Detailed Description of the Invention]

[0001]

[Industrially Applicable Field]

The present invention relates to a three-dimensional structure cloth in wavy form used for multipurpose, such as shock absorbing material, air or water permeable cushion material, civil engineering material, filters for air conditioners, nets for drainage, water culture material, etc.

[0002]

[Prior Art]

As for a conventional wavy-formed three-dimensional structure cloth, there is one disclosed, for example, in the Japanese laid-open patent publication No. 321984/1989. Specifically, in the three-dimensional structure cloth, synthetic resin fiber having high thermal shrinkage is combined with synthetic resin fiber having a lower thermal shrinkage than that or no thermal shrinkage in the warp and weft directions, respectively, to constitute a woven fabric, which is then thermally processed under a proper temperature condition to form resilient portions in wavy form by curving synthetic resin fiber having lower thermal shrinkage caused by thermal shrinkage of thermally shrinkable fiber or having no thermal shrinkage.

[0003]

However, in such a conventional three-dimensional structure cloth there is used polyethylene monofilament having the maximum shrinkage of about 20% as a synthetic resin fiber having higher thermal shrinkage, which causes a difficulty in obtaining sufficient shrinkage, due to which a three-dimensional structure cloth in better wavy form cannot be obtained, which necessarily causes to form flat wavy forms, resulting in reduced impact resilience. Further, since synthetic resin fiber having higher thermal shrinkage is used only in the upper part in the vertical direction in connection to the woven fabric, i.e., the ground structure, there has been a problem of insufficient shape stability, poor resistance to tension and worsened durability.

[0004]

In addition, due to low shrinkage of polyethylene monofilament it has also been a problem that thermal processing

takes time as long as 0.5 - 3 hours.

[0005]

[Problems To Be Solved By The Invention]

It is an object of the invention as defined in claim 1 to provide a three-dimensional structure cloth in which highly shrinkable yarns with shrinkage of 30% or more are used and made into wavy form by dry heat restriction shrinkage treatment, thereby making it possible to produce warped and good wavy forms, secure high impact resilience, and further improve shape stability by arranging highly shrinkable yarns on the front and rear surfaces of the ground structure as well as to attain significant improvement in resistance to tension and significant reduction in heat processing time.

[0006]

It is an object of the invention as defined in claim 2, in addition to the object of the invention as defined in claim 1, to provide a three-dimensional structure cloth, in which copolymer polyethylene terephthalate having shrinkage of 45 - 50% is used as the highly shrinkable yarns described above to make it possible to secure sufficient shrinkage as well as to attain significantly improved impact resilience by forming much better wavy forms.

[0007]

[Means To Solve The Problems]

The present invention as defined in claim is a three-dimensional structure cloth of a woven fabric, characterized in that the fabric comprises: a ground structure constituted of warp and weft made of monofilament yarn woven in plane or leno

weave; and highly shrinkable yarns with shrinkage factor of 30% or more arranged at a predetermined interval and having a mixed weave portion partially bound on front and rear surfaces of the ground structure in a vertical direction and an unbound float weave portion, the fabric being subjected to dry heat restriction shrinkage treatment to be wavy.

[0008]

The present invention as defined in claim 2 is a three-dimensional structure cloth, characterized in that, in addition to the structure in accordance with the invention as defined in claim 1, said highly shrinkable yarns are composed of copolymer polyethylene terephthalate.

[0009]

[Operation and Advantages of The Invention]

According to the invention as defined in claim 1, when the woven fabric with highly shrinkable yarns arranged on the front and rear surfaces of the ground structure in the vertical direction is subjected to dry heat restriction shrinkage treatment (treatment for restricting and regulating shrinkage in order to produce wavy forms), the highly shrinkable yarns shrink in the vertical direction at a shrinkage rate of 30% or more and restrictively, thereby making it possible to constitute a warped and good wave-formed three-dimensional structure cloth.

[0010]

As the result, it is possible to obtain such effects that high impact resilience can be obtained, and yet, as highly shrinkable yarns are arranged on the front and rear surfaces of the above-described ground structure, in other words, in the

upward and downward, vertical direction thereof, the shape stability is heightened as well as significant improvement in resistance to tension is attained, which in general leads to improved durability and significant reduction in time required for dry heat restriction shrinkage treatment.

[0011]

According to the invention as defined in claim 2, in addition to the advantages of the invention as defined in claim 1, it is possible to obtain such an effect that copolymer polyethylene terephthalate with shrinkage of 45 - 50% is used as the above-described highly shrinkable yarns, sufficient shrinkage can be obtained and the high shrinkage produces much better wavy forms to attain heightened impact resilience.

[0012]

[Embodiment(s)]

In the following, embodiments in accordance with the invention will be described in detail with reference to the accompanying drawings. The drawings show a three-dimensional structure cloth. In FIG. 1, polypropylene monofilament (this monofilament has rigidity and is capable of maintaining shape stability in three-dimensional structure of a three-dimensional structure cloth) of 1000 deniers is used in the warp 1 and the weft 2, in which the density is 25 yarns/inch for the warp and 7 yarns/inch for the weft (roughly shown in the figure), and the warp 1 and weft 2 are woven to be interlaced with each other as shown in FIG. 3, to constitute a ground structure 3 having no deflection in position between the yarns 1 and 2.

[0013]

As highly shrinkable yarns 4 and 5 having mixed weave portions 4a, 5a (3-yarn interlaced structure in this embodiment) partially bound to the front and rear surfaces of the ground structure 3 in the vertical direction and unbound float weave portions 4b, 5b, copolymer ethylene terephthalate multi-yarns (a multi-yarn is one consisted of a plurality of yarns) having shrinkage of 45-50% and 1000 deniers are used to constitute a woven fabric A (see FIG. 1) having the yarns arranged with a density of 2.5 yarns/inch at a constant interval alternately in the upper and lower portions. The length of the above-described float weave portions 4b, 5b is 4 cm.

[0014]

A woven fabric A shown in FIG. 1 has been subjected, for example, to 45% overfeed treatment (dry heat restriction shrinkage treatment) at 130°C for five minutes to constitute a three-dimensional structure cloth B in wavy form having the wave height of 2 cm as shown in FIG. 2. More specifically, when the above-described woven fabric A is subjected to dry heat restriction shrinkage treatment, highly shrinkable yarns in the upper and lower portions 4, 5 shrink in the longitudinal direction by a predetermined percent to cause the mixed weave portions 4a, 5a of the ground structure 3 to curve wavyly to form peak and trough portions, with the result that a wave-formed three-dimensional structure cloth B is formed.

[0015]

As described above, when the woven fabric A having highly shrinkable yarns 4, 5 arranged on the front and rear surfaces of the ground structure 3 in the vertical direction is subjected to dry heat restriction shrinkage treatment (treatment for

restricting and regulating shrinkage in order to form wave forms), the highly shrinkable yarns 4, 5 of the front and rear surfaces thereof restrictedly shrink at a shrinkage rate of 30% or more (45% in this embodiment) in the vertical direction to thus make it possible to constitute a warped and good wave-formed three-dimensional structure cloth B.

[0016]

As the result, it is possible to attain such effects that high impact resilience can be obtained, and yet, as highly shrinkable yarns 4, 5 are arranged on the front and rear surfaces of the above-described ground structure 3, in other words, in the upward and downward, vertical direction thereof, the shape stability is heightened as well as significant improvement in resistance to tension is attained, which in general leads to improved durability and significant reduction in time required for dry heat restriction shrinkage treatment.

[0017]

In addition to the above, it is possible to attain such an effect that copolymer polyethylene terephthalate with shrinkage of 45 - 50% is used as the above-described highly shrinkable yarns 4, 5, sufficient shrinkage can be obtained and the high shrinkage produces much better wave-forms to attain heightened impact resilience.

[0018]

In addition, the above-described ground structure 3 may be constituted of the warp 1 and the weft 2 in plane weave, as shown in FIG. 3. Further, as the wave-formed three-dimensional structure cloth B so constituted as described above is formed to

have even thickness and has high repellency and resilience as well as it is excellent in air or water permeability and cushion property, it can be used for multipurpose, such as shock absorbing material, air permeable or water permeable cushion material, civil engineering material, filters for air conditioners, nets for drainage, water culture material, etc.

[0019]

In the correlation of the present invention with the above-described embodiments, the warp 1 and the weft 2 in the present invention correspond to polypropylene monofilament of 1000 deniers in the embodiment, and the highly shrinkable yarns with shrinkage of 30% or more correspond to copolymer polyethylene terephthalate multi-yarn of 1000 deniers, while the present invention is not confined only to the structure of the above-described embodiment.

[0020]

For example, material for the monofilament yarn used in the warp 1 and the weft 2 may be synthetic resin, such as polyester, polyamide, polyethylene, etc., instead of the above-described polypropylene, and may also be natural fiber for use where it is desirable to be deteriorated due to aging. The denier of the monofilament yarn may be freely selected in the range of 100 - 2000 deniers, in addition to 1000 deniers, according to every purpose of use. The cushion property can be freely adjusted by selecting the degree of denier and further difference in shrinkage between the highly shrinkable yarns 4, 5 and the monofilament is preferably 10-50%.

[Brief Description of the Drawing(s)]

[FIG. 1] is a partial plan view showing the state of a three-dimensional structure cloth in accordance with the invention prior to dry heat restriction shrinkage treatment.

[FIG. 2] is a partial perspective view showing a three-dimensional structure cloth in accordance with the invention.

[FIG. 3] is a partial plan view showing an embodiment of a ground structure.

[FIG. 4] is a partial plan view showing another embodiment of the ground structure.

[List of Reference Numerals]

1....Warp

2....Weft

3....Ground Structure

4, 5....Highly Shrinkable Yarns

4a, 5a...Mixed Weave Parts

4b, 5b...Float Weave Parts

A....Woven Fabric

B....Three-dimensional Structure Cloth

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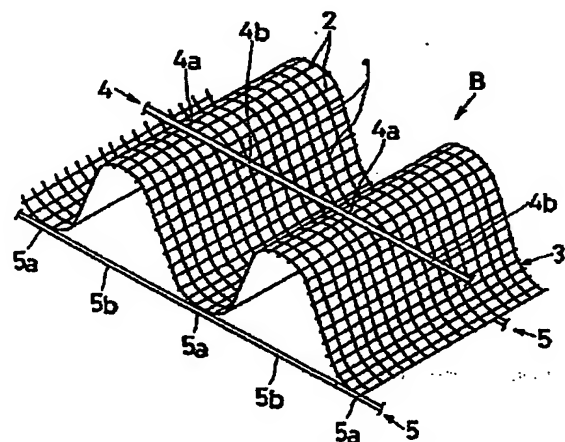
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(54) 【発明の名称】 立体構造布

(57) 【要約】

【目的】 収縮率30%以上の高収縮系を用い、かつ乾熱制限収縮処理により波形に構成することで、成形された良好な波形を形成することができ、高い反発弾性力を確保することができるうえ、地組織の表裏両面に高収縮系を配列することで、形状安定性が向上すると共に、抗張力の大幅な向上を図り、かつ熱処理時間の大幅な短縮を図る。

【構成】 モノフィラメント糸製のタテ糸1およびヨコ糸2が平織もしくは撚み織して構成された地組織3を設け、上記地組織3の表面および裏面のタテ方向に対して該地組織3に部分的に結合された交織部4a、5aと非結合の浮織部4b、5bとを有する収縮率30%以上の高収縮糸4、5が所定間隔で配列された織物を乾熱制限収縮処理して波状に構成したことを特徴とする。



1…タテ糸 4a, 5a…交織部
2…ヨコ糸 4b, 5b…浮織部
3…地組織 B…立体構造布
4, 5…高収縮糸

【特許請求の範囲】

【請求項1】モノフィラメント糸製のタテ糸およびヨコ糸が平織もしくは撚み織して構成された地組織を設け、上記地組織の表面および裏面のタテ方向に対して該地組織に部分的に結合された交織部と非結合の浮織部とを有する収縮率30%以上の高収縮糸が所定間隔で配列された織物を乾熱制限収縮処理して波状に構成した立体構造布。

【請求項2】上記高収縮糸として共重合ポリエチレンテレフタレートを用いた請求項1記載の立体構造布。

【発明の詳細な説明】

【0001】

【産業上の利用分野】この発明は、例えば、緩衝材、通気性クッション材、通水性クッション材、土木用資材、空調機のフィルタ材、排水用のネット材、水耕栽培用資材などの多目的に用いられる波形状の立体構造布に関する。

【0002】

【従来の技術】従来の波形状の立体構造布としては、例えば、特開平1-321948号公報に記載のものがあ
る。すなわち、熱収縮性の大きい合成樹脂繊維と、これより熱収縮性の小さいか、又は熱収縮性のない合成樹脂繊維とをタテ、ヨコに組み合わせ織成した織地を適当温度条件で熱処理し、熱収縮性繊維の熱収縮により熱収縮性の小さいか熱収縮性のない合成繊維の屈曲による波形状の弾性部を形成した立体構造布である。

【0003】しかし、この従来の立体構造布については熱収縮性の大きい合成樹脂繊維としてその収縮率が最大20%前後のポリエチレンモノフィラメントが用いられているので、十分な収縮率が得られず、これに起因して立体構造布の良好な波形が得られないで、必然的に扁平な波状となって反発弾性力が小となるばかりでなく、上述の織地つまり地組織に対してそのタテ方向上部にのみ熱収縮性の大きい合成樹脂繊維が用いられているので、形状安定性に乏しく、抗張力が弱く、耐久性が悪い問題点があった。

【0004】加えて、ポリエチレンモノフィラメントの収縮率の悪さに起因して、熱処理時間も0.5~3時間の長時間を要するという問題点があった。

【0005】

【発明が解決しようとする課題】この発明の請求項1記載の発明は、収縮率30%以上の高収縮糸を用い、かつ乾熱制限収縮処理により波形に構成することで、成形された良好な波形を形成することができ、高い反発弾性力を確保することができるうえ、地組織の表裏両面に高収縮糸を配列することで、形状安定性が向上すると共に、抗張力の大幅な向上を図ることができ、かつ熱処理時間の大幅な短縮を図ることができる立体構造布の提供を目的とする。

【0006】この発明の請求項2記載の発明は、上記請

求項1記載の発明の目的と併せて、上記高収縮糸として収縮率が45~50%の共重合ポリエチレンテレフタレートを用いることで、十分な収縮率を確保すると共に、より一層良好な波形状として、高反発弾性力の向上を図ることができる立体構造布の提供を目的とする。

【0007】

【課題を解決するための手段】この発明の請求項1記載の発明は、モノフィラメント糸製のタテ糸およびヨコ糸が平織もしくは撚み織して構成された地組織を設け、上記地組織の表面および裏面のタテ方向に対して該地組織に部分的に結合された交織部と非結合の浮織部とを有する収縮率30%以上の高収縮糸が所定間隔で配列された織物を乾熱制限収縮処理して波状に構成した立体構造布であることを特徴とする。

【0008】この発明の請求項2記載の発明は、上記請求項1記載の発明の構成と併せて、上記高収縮糸として共重合ポリエチレンテレフタレートを用いた立体構造布であることを特徴とする。

【0009】

【発明の作用及び効果】この発明の請求項1記載の発明によれば、上述の地組織の表裏タテ方向に高収縮糸が配列された織物を乾熱制限収縮処理（波形を整形するための縮み率を制限、規制する処理）すると、この高収縮糸がタテ方向に収縮率30%以上で、かつ制限収縮するので、整形された良好な波状立体構造布を構成することができる。

【0010】この結果、高い反発弾性力を確保することができ、しかも上述の地組織の表裏、換言すれば上下タテ方向には高収縮糸が配列されているので、形状安定性が向上すると共に、抗張力の大幅な向上を図ることができ、総じて耐久性の向上を図ることができる効果があり、かつ乾熱制限収縮処理時間の大幅な短縮を図ることができる効果がある。

【0011】この発明の請求項2記載の発明によれば、上記請求項1記載の発明の効果と併せて、上述の高収縮糸として収縮率が45~50%の共重合ポリエチレンテレフタレートを用いたので、十分な収縮率を確保することができると共に、高い収縮率により、より一層良好な波形状と成して、高反発弾性力の向上を図ることができる効果がある。

【0012】

【実施例】この発明の一実施例を以下図面に基づいて詳述する。図面は立体構造布を示し、図1においてタテ糸1およびヨコ糸2に1000デニールのポリプロピレン製モノフィラメント（このモノフィラメントは立体構造布の立体構造形態安定性を維持し得る剛性をもつモノフィラメントである）を用い、タテ密度を25本/インチ、ヨコ密度を7本/インチ（但し図面では概略示している）とし、上述のタテ糸1およびヨコ糸2を図3に示すように撚み織して、各糸1、2の位置ずれがない地組

織3を構成している。

【0013】この地組織3の表面および裏面のタテ方向に対して該地組織3に部分的に結合された交織部4a、5a（この実施例では3本編み構造）と非結合の浮織部4b、5bとを有する高収縮系4、5として、その収縮率が45～50%ので、1000デニールの共重合ポリエチレンテレフタレートマルチ系（ここにマルチ系とは多本数で1本が構成されたもの）を用い、2、5本/インチの等間隔で上下交互に配列した織物A（図1参照）を構成している。ここで、上述の浮織部4b、5bの長さは約4cmとしている。

【0014】上述の図1に示す織物Aを例えば130℃の乾熱で5分間、45%オーバーフィード処理（乾熱制限収縮処理）して、図2に示す如き波形高2cmの波状の立体構造布Bを構成したものである。すなわち、上述の織物Aを乾熱制限収縮処理すると、上下の高収縮系4、5が所定パーセントだけその長手方向に収縮するので、交織部4a、5aを山部と谷部と成す形状に地組織3が波形に屈曲して、波状の立体構造布Bが形成される。

【0015】このように、上述の地組織3の表裏タテ方向に高収縮系4、5が配列された織物Aを乾熱制限収縮処理（波形を整形するために縮み率を制限、規制する処理）すると、これら表裏の高収縮系4、5がタテ方向に収縮率30%以上で、かつ制限収縮（この実施例では45%収縮）するので、整形された良好な波状の立体構造布Bを構成することができる。

【0016】この結果、上述の波形状により高い反発弾性力を確保することができ、しかも上述の地組織Aの表裏、換言すれば上下タテ方向には高収縮系4、5が配列されているので、形状安定性が向上すると共に、抗張力の大幅な向上を図ることができ、総じて耐久性の向上を図ることができる効果があり、乾熱制限収縮処理時間の大幅な短縮を図ることができる効果がある。

【0017】加えて、上述の高収縮系4、5として収縮率が45～50%の共重合ポリエチレンテレフタレートを用いたので、十分な収縮率を確保することができると共に、高い収縮率により、より一層良好な波形状と成して、高反発弾性力の向上を図ることができる効果がある。

【0018】なお、上述の地組織3は図4に示すように

タテ系1およびヨコ系2を平織にして構成してもよい。また上記構成の波状の立体構造布Bは均一な厚み構成され、大きい反発力、弾力性を有すると共に、通気性、通水性、クッション性に優れるので、緩衝材、通気性クッション材、通水性クッション材、土木用資材、空調機のフィルタ材、排水用ネット材、水耕栽培用資材などの多目的に用いることができる。

【0019】この発明の構成と、上述の実施例との対応において、この発明のタテ系1およびヨコ系2は、実施例の1000デニールのポリプロピレン製モノフィラメントに対応し、収縮率30%以上の高収縮系は、1000デニールの共重合ポリエチレンテレフタレートマルチ系に対応するも、この発明は、上述の実施例の構成のみに限定されるものではない。

【0020】例えば、上述のタテ系1、ヨコ系2に用いるモノフィラメント系の素材としては上述のポリプロピレンに代えてポリエステル、ポリアミド、ポリエチレン等の合成樹脂の他に、経時変化に伴って腐敗させた方が望ましい用途に用いる際には天然繊維であってもよく、上述のモノフィラメント系の使用繊維は用途に対応して1000デニール以外に100～2000デニールの範囲で自由に選定することができ、クッション性はデニールの選定により任意に調整することができ、さらに、高収縮系4、5のモノフィラメントに対する収縮差は10～50%が望ましい。

【図面の簡単な説明】

【図1】本発明の立体構造布の乾熱制限収縮前の状態を示す部分平面図。

【図2】本発明の立体構造布を示す部分斜視図。

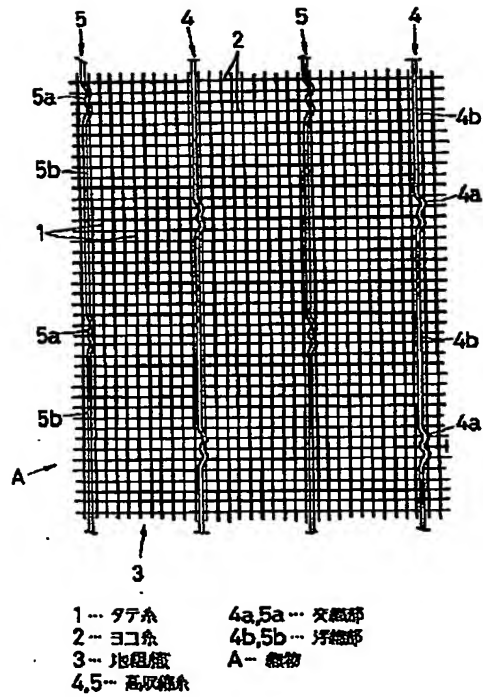
【図3】地組織の一例を示す部分平面図。

【図4】地組織の他の例を示す部分平面図。

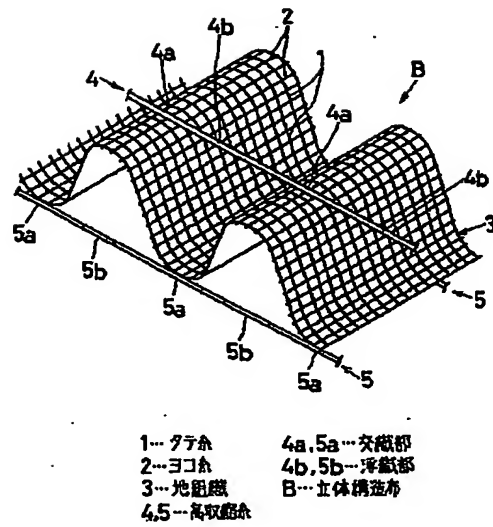
【符号の説明】

- 1…タテ系
- 2…ヨコ系
- 3…地組織
- 4、5…高収縮系
- 4a、5a…交織部
- 4b、5b…浮織部
- A…織物
- B…立体構造布

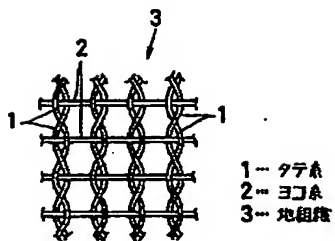
【図1】



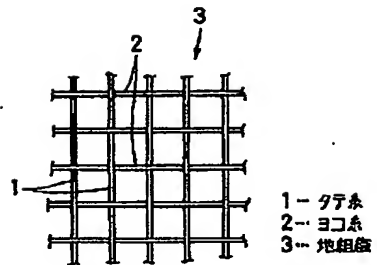
【図2】



【図3】



【図4】



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